

Machine Translation

## PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2000-111957  
 (43)Date of publication of application : 21.04.2000

(51)Int.Cl. G02F 1/1365  
 G02F 1/1337  
 G02F 1/1343  
 G09F 9/30  
 H01L 29/786  
 H01L 21/336

(21)Application number : 11-168334  
 (22)Date of filing : 15.06.1999

(71)Applicant : NEC CORP  
 (72)Inventor : SAKAMOTO MICHIAKI  
 WATANABE TAKAHIKO  
 IHARA HIROSHI  
 YOSHIKAWA SHUKEN  
 OKAMOTO MAMORU  
 NAKADA SHINICHI  
 YAMAMOTO YUJI  
 SUZUKI SHIGEYOSHI  
 SUZUKI TERUAKI  
 ISHII TOSHIYA  
 KANO HIROSHI

(30)Priority

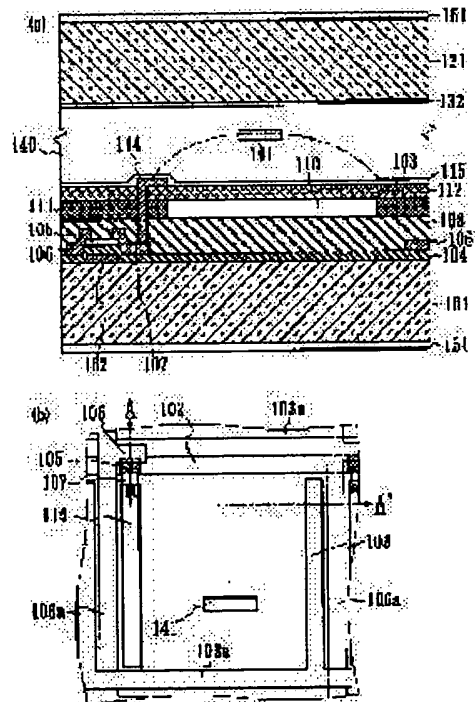
Priority number : 10219314 Priority date : 03.08.1998 Priority country : JP

(54) LIQUID CRYSTAL DISPLAY DEVICE AND ITS MANUFACTURE

(57)Abstract:

PROBLEM TO BE SOLVED: To prevent generation of color unevenness in a liquid crystal display device.

SOLUTION: A color filter layer 110 is arranged on a protection film 108 of a thin film transistor separated by a light shielding part 111. A common electrode 103 is arranged thereon. Furthermore, a pixel electrode, connected to a source electrode 107 via a through hole formed in an overcoat layer (an interlayer separation film) 112, is arranged.



LEGAL STATUS

[Date of request for examination]	15.06.1999
[Date of sending the examiner's decision of rejection]	
[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]	
[Date of final disposal for application]	
[Patent number]	3114723
[Date of registration]	29.09.2000
[Number of appeal against examiner's decision of rejection]	
[Date of requesting appeal against examiner's decision of rejection]	
[Date of extinction of right]	

Copyright (C); 1998,2003 Japan Patent Office

\* NOTICES \*

Japan Patent Office is not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

DESCRIPTION OF DRAWINGS

---

[Brief Description of the Drawings]

[Drawing 1] It is the cross section and plan showing the composition of the liquid crystal display in the gestalt of implementation of the 1st of this invention.

[Drawing 2] It is explanatory drawing for explaining the manufacture method of the liquid crystal display of the gestalt 1 operation.

[Drawing 3] It is explanatory drawing for explaining the manufacture method of the liquid crystal display of the gestalt 1 operation following drawing 2 .

[Drawing 4] It is the cross section and plan showing the composition of the liquid crystal display in the gestalt of implementation of the 2nd of this invention.

[Drawing 5] It is the plan and cross section showing the composition of the liquid crystal display in the gestalt of implementation of the 3rd of this invention.

[Drawing 6] It is explanatory drawing for explaining the manufacture method of the liquid crystal display of the gestalt 3 operation.

[Drawing 7] It is the plan and cross section showing the composition of the liquid crystal display in the gestalt of implementation of the 4th of this invention.

[Drawing 8] It is explanatory drawing for explaining the manufacture method of the liquid crystal display of the gestalt 4 operation.

[Drawing 9] It is the plan and cross section showing the composition of the liquid crystal display in the gestalt of implementation of the 5th of this invention.

[Drawing 10] It is process drawing showing the method of the rubbing processing in the gestalt of implementation of the 5th of this invention.

[Drawing 11] It is process drawing showing other methods of the rubbing processing in the gestalt of implementation of the 5th of this invention.

[Drawing 12] It is the block diagram showing the composition of the TFT liquid crystal display of an certain installation-performance-specification method conventionally.

[Description of Notations]

101 [ -- Common electrode, ] -- A glass substrate, 102 -- A gate electrode (scanning signal electrode), 103 103a [ -- Semiconductor film, ] -- Common electrode wiring, 104 -- A gate insulator layer, 105 106 [ -- Source electrode, ] -- A drain electrode, 106a -- The data line (video-signal electrode), 107 108 [ -- The shading section, 112 / -- An overcoat layer (demarcation membrane between layers), 114 / -- A pixel electrode, 115 / -- An orientation film, 131 / -- An opposite substrate, 132 / -- An orientation film, 140 / -- A liquid crystal constituent layer, 141 / -- A liquid crystal molecule, 151 / -- Polarizing plate. ] -- A protective coat, 110 -- A light-filter layer, 111

---

[Translation done.]

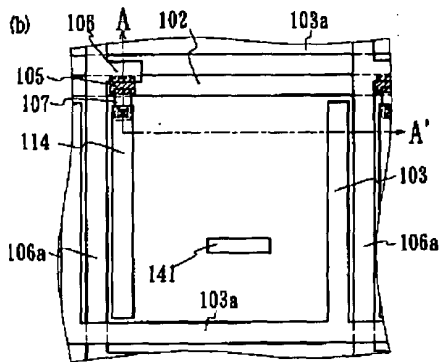
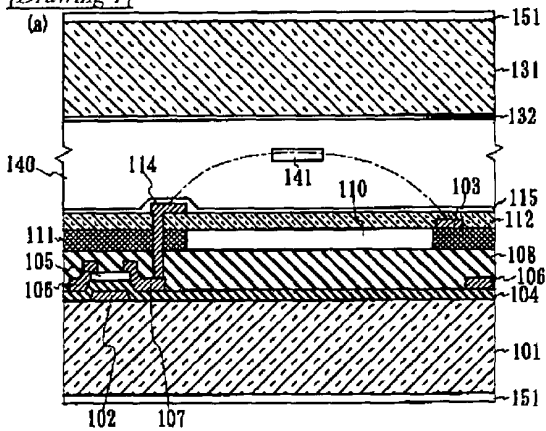
\* NOTICES \*

Japan Patent Office is not responsible for any damages caused by the use of this translation.

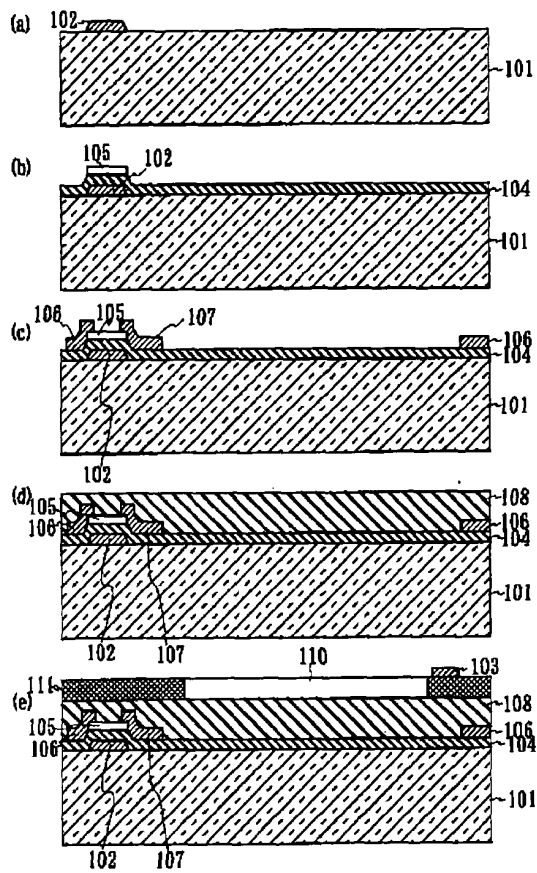
1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

DRAWINGS

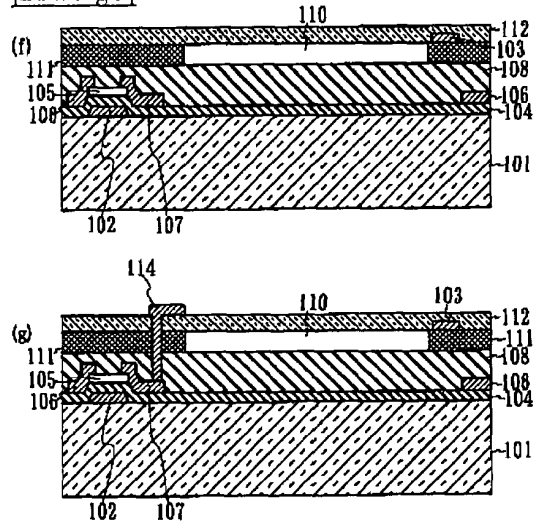
[Drawing 1]



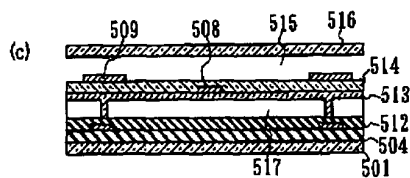
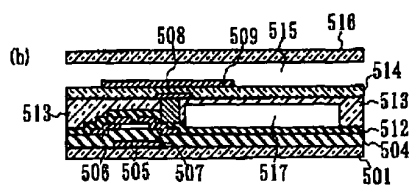
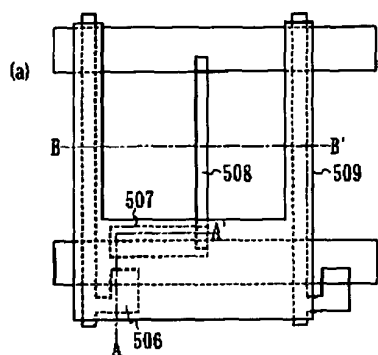
[Drawing 2]



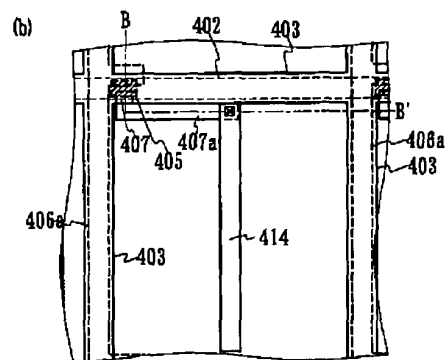
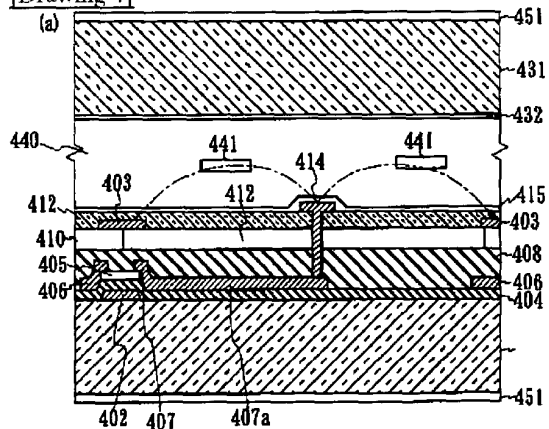
[Drawing 3]



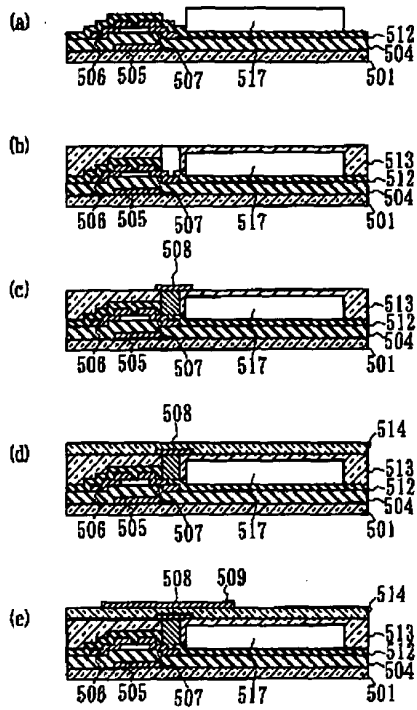
[Drawing 5]



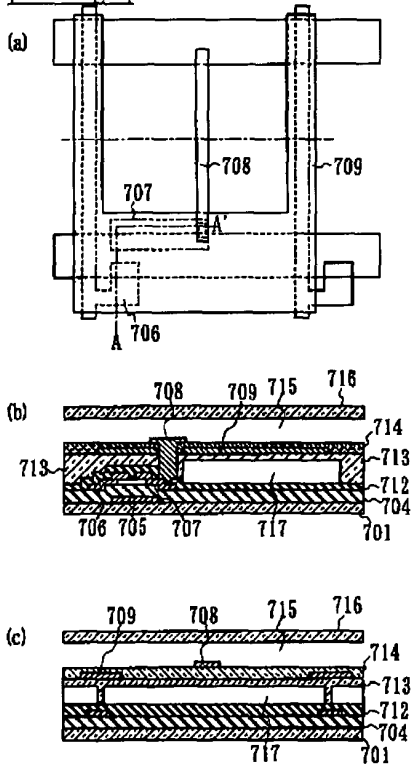
[Drawing 4]



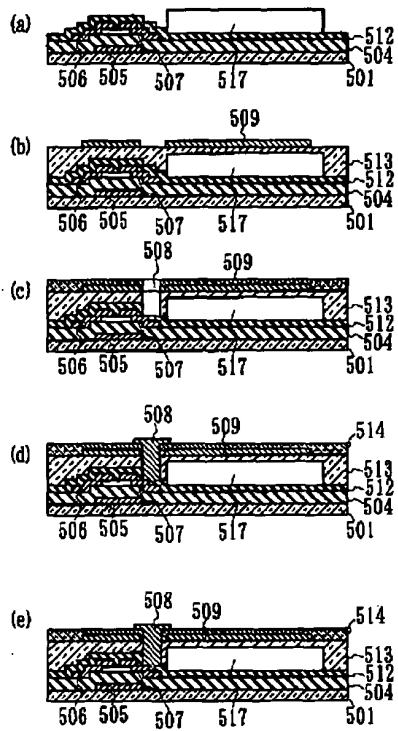
[Drawing 6]



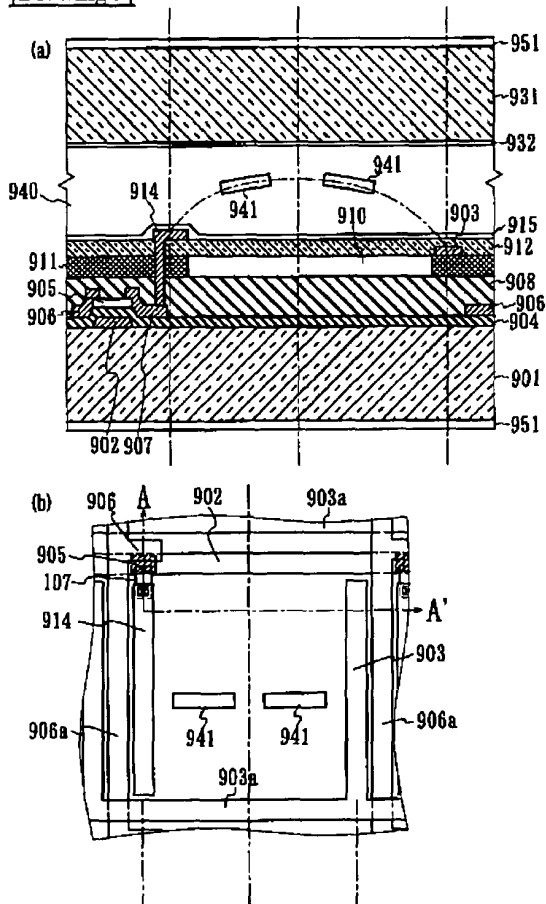
[Drawing 7]



[Drawing 8]

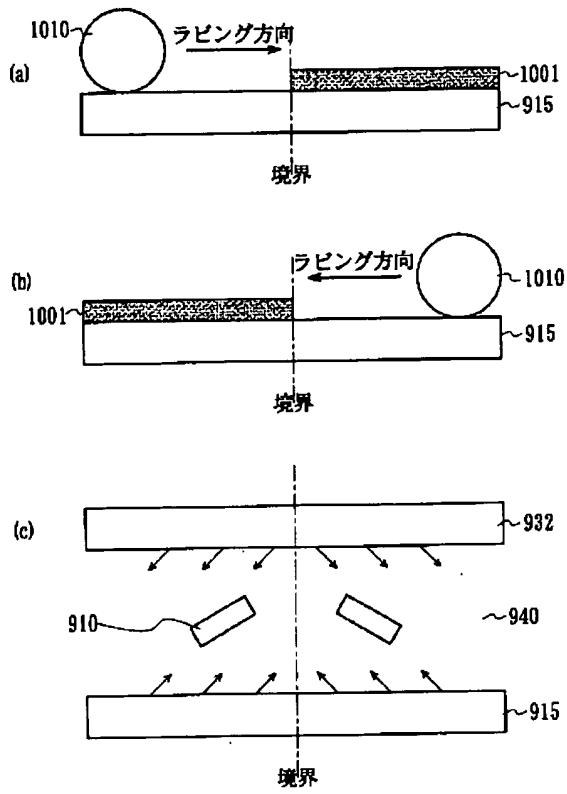


[Drawing 9]

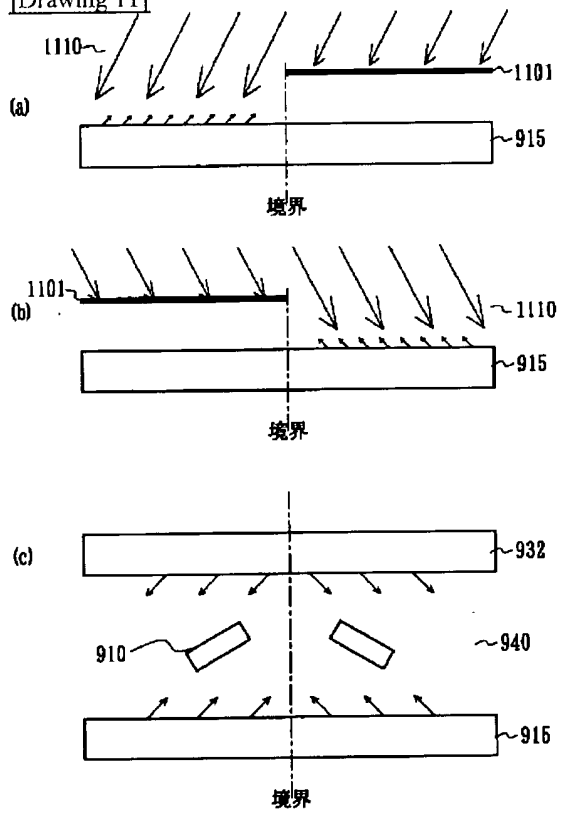


[Drawing 10]

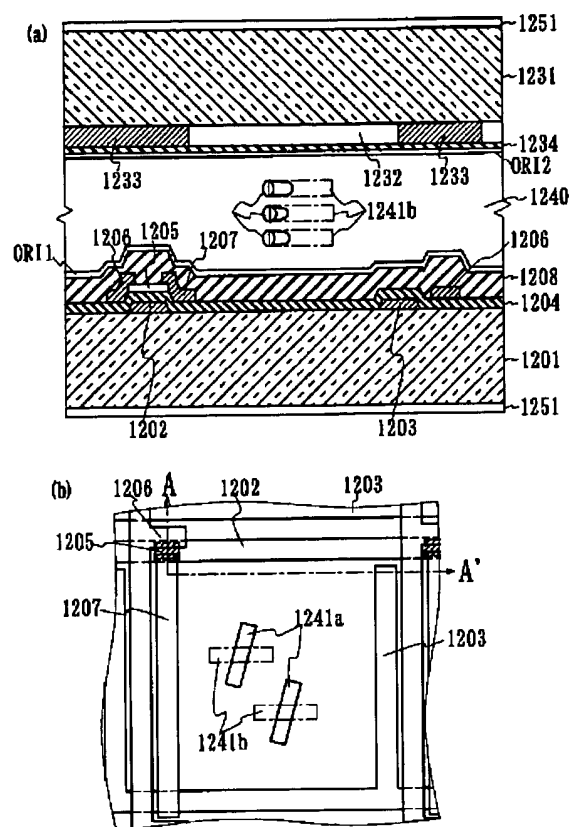




[Drawing 11]



[Drawing 12]



[Translation done.]

## \* NOTICES \*

**Japan Patent Office is not responsible for any damages caused by the use of this translation.**

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

DETAILED DESCRIPTION

---

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] This invention arranges TFT (TFT) in the shape of a matrix, and relates to the liquid crystal display of an active-matrix form using this as a switching element, and its manufacture method.

[0002]

[Description of the Prior Art] TFT (it abbreviates to "TFT" below Thin Film Transistor:) is formed in the shape of a matrix on a glass substrate, and the active matrix liquid crystal display using this as a switching element is developed as a high-definition flat-surface display. In the torsion pneumatic (it is written as below twisted nematic; "TN") type active matrix liquid crystal display currently used widely conventionally The transparent electrode which formed the electrode which drives a liquid crystal layer on two glass substrates, and was made to counter is used. When a liquid crystal molecule changes the sense of an orientation vector in the direction of electric field from "white" display state where the liquid crystal molecule at the time of voltage un-impressing is parallel to a substrate front face, according to applied voltage, it is considering as "black" display gradually from "white" display state.

[0003] However, there is a problem that the angle of visibility of TN liquid crystal display is narrow, by behavior with the characteristic liquid crystal molecule of this voltage impression. The problem that this angle of visibility is remarkable especially in the direction of a standup of the liquid crystal molecule in a halftone display. Technology which is indicated by JP,4-261522,A or JP,6-43461,A is proposed as a method of improving the viewing-angle property of the liquid crystal display. by using the common electrode which has opening, slanting electric field were generated in each pixel, each pixel was made into two or more liquid crystal domains by this, and the viewing-angle property is improved as the liquid crystal cell which carried out the homeotropic orientation is created with the technology of these, it inserts between two polarizing plates installed so that a polarization shaft might intersect perpendicularly and it is shown in drawing of the official report Especially in JP,4-261522,A, when voltage is impressed, high contrast is realized by controlling the direction to which liquid crystal inclines.

[0004] Moreover, the optical compensating plate was used if needed and the black viewing-angle property is improved as indicated by JP,6-43461,A. Furthermore, in JP,6-43461,A, also not only in the liquid crystal cell which carried out the homeotropic orientation but in the cell which carried out TN orientation, slanting electric field divided each pixel into two or more domains, and the viewing-angle property is improved. Moreover, since an official announcement patent common No. 505247 [ five to ] official report is rotated maintaining a liquid crystal molecule at a substrate and a horizontal direction, the liquid crystal display of the installation-performance-specification (In-Plane-Switching) method it was made to produce a substrate and horizontal electric field is proposed, preparing both two electrodes on one of the two's substrate, and applying voltage to inter-electrode [ these / two ]. By this method, when voltage is impressed, the major axis of a liquid crystal molecule does not start to a substrate. For this reason, change of the birefringence of the liquid crystal when changing the viewing-angle direction is small, and there is the feature of latus in an angle of visibility.

[0005] Thus, both two electrodes are explained below about the active matrix liquid crystal display of the installation-performance-specification method formed on one of the two's substrate. The TFT liquid crystal display of this installation-performance-specification method is constituted as shown in drawing 12 . In addition, in drawing 12 , drawing 12 (a) shows the cross section of the AA' line of the plan of drawing 12 (b) . First, the gate electrode 1202 and the common electrode 1203 which consist of Cr are formed on a glass substrate 1201, and the gate insulator layer 1204 which consists of a silicon nitride so that these electrodes may be covered is formed. Moreover, on the gate electrode 1202, the semiconductor film 1205 which consists of amorphous silicon through the gate insulator layer 1204 is formed, and it is made as [ function / as an active layer of a transistor ]. Moreover, the drain electrode 1206 and the source electrode 1207 which consist of molybdenum are formed so that it may superimpose on some patterns of the semiconductor film 1205, and the protective coat 1208 which consists of a silicon nitride so that these [ all ] may be covered is formed.

[0006] Moreover, as shown in drawing 12 (b) , a 1-pixel field will be arranged between the source electrode 1207 and the common electrode 1203 currently pulled out. And the orientation film ORI1 is formed in the front face of the active-matrix substrate which has arranged the unit pixel constituted as mentioned above in the shape of a matrix. Rubbing processing of this orientation film ORI1 front face is carried out. On the other hand, the light-filter layer 1232 is divided into the opposite substrate 1231 which consists of glass in the shading section 1233, it is formed, and the protective coat 1234 is formed on these. And the orientation film ORI2 is formed also in this protective coat 1234 front face, and rubbing processing also of this orientation film ORI2 front face is carried out.

[0007] And opposite arrangement of a glass substrate 1201 and the opposite substrate 1231 is carried out by the orientation film ORI1 and orientation film ORI2 forming face, and the liquid crystal constituent 1240 is arranged among these. Moreover, the polarizing plate 1251 is formed in the field of the outside of a glass substrate 1201 and the opposite substrate 1231. In addition, the shading section 1233 which has divided the light-filter layer 1232 is formed so that it may arrange on the TFT which some of the fields become from the semiconductor film 1205.

[0008] In the active matrix liquid crystal display constituted as mentioned above, when electric field are not built over the liquid crystal constituent 1240, liquid crystal molecule 1241a is in the state about parallel to the extension direction of these electrodes, and is carrying out homogeneous orientation. That is, orientation of the liquid crystal molecule 1241a is carried out so that the angle with the method of the direction of the electric field formed between the direction of the major axis (optical axis) of liquid crystal molecule 1241a, and the source electrode 1207 and the common electrode 1203 currently pulled out to make may become 45 degrees or more less than 90 degrees. In addition, the orientation of the glass substrate 1201 and the opposite substrate 1231 by which opposite arrangement is carried out, and liquid crystal molecule 1241a is mutually parallel. Moreover, the dielectric anisotropy of liquid crystal molecule 1241a was made positive.

[0009] Here, if voltage is impressed to the gate electrode 1202 and TFT (TFT) is turned ON, voltage will be impressed to the source electrode 1207 and induction of the electric field will be carried out between the source electrode 1207 and the common electrode 1203 which is carrying out opposite arrangement at this. And liquid crystal molecule 1241a changes the sense to liquid crystal molecule 1241b by this electric field. This liquid crystal molecule 1241b will be in a state almost parallel to the direction of the electric field formed between the source electrode 1207 and the common electrode 1203 which is carrying out opposite arrangement at this. And the permeability of light can be changed by the movement of the liquid crystal molecule mentioned above by arranging the change transparency shaft of a polarizing plate 1251 at a predetermined angle.

[0010] Thus, in the active matrix liquid crystal display of this installation-performance-specification method, even if there is no transparent electrode, contrast can be given. And with the active matrix liquid crystal display of the installation-performance-specification method mentioned above, the major axis of a liquid crystal molecule is almost parallel to a substrate flat surface, and it does not start by impressing voltage. For this reason, change of the luminosity when changing the viewing-angle direction has the effect that it is small and a visual-sense property is improved sharply.

[0011] Furthermore, a dielectric constant anisotropy carries out the homeotropic orientation of the positive liquid crystal other than the above-mentioned installation-performance-specification mode to reference (Journal of Applied Physics, Vol.45, No.12 (1974) 5466) or JP,10-186351, A perpendicularly to a substrate, and the method which pushes down a liquid crystal molecule on a substrate and a horizontal direction by electric field horizontal to a substrate is stated to it. At this time, the liquid crystal molecule which carried out the homeotropic orientation for the direction of electric field is divided into two or more fields to which the directions to which it inclines differ.

[0012]

[Problem(s) to be Solved by the Invention] However, in an installation-performance-specification method, by the former, since the layer of a light filter was arranged between the layers and opposite substrates by which liquid crystal is arranged, the electric field formed by impressing potential between a source electrode and the common electrode currently pulled out affected the layer of a light filter, and there was a problem of worsening the property of a display of active matrix liquid crystal display. That is, since sodium ion etc. is contained as an impurity, when electric field are built over the layer of a light filter, a charge will accumulate and carry out a charge up to the coloring matter which constitutes a light-filter layer there. And if the layer of a light filter carries out a charge up, since electric field unnecessary to the liquid crystal of the lower part of the part will be in the state where it has started always, a display property will be affected.

[0013] The purpose of this invention aims at suppressing generating of color nonuniformity in this liquid crystal display. Another purpose of this invention is offering such a manufacture method that creates a liquid crystal display easily.

[0014]

[Means for Solving the Problem] The liquid crystal display by this invention has the 1st transparent substrate, the 2nd transparent substrate, the liquid crystal layer pinched by these, and a light-filter layer. The light-filter layer is arranged on the 1st substrate, and a liquid crystal layer is arranged between a light-filter layer and the 2nd substrate. on the 1st [ under a light-filter layer ] substrate Two or more scanning signal electrodes and two or more video-signal electrodes which intersect them in the shape of a matrix, It has two or more TFT formed corresponding to each intersection of these electrodes. The common electrode which at least one pixel consists of each field surrounded by two or more scanning signal electrodes and video-signal electrodes, is connected to each pixel over two or more pixels by common electrode wiring, and gives a reference potential, Connect with corresponding TFT and it has the pixel electrode which countered the common electrode and has been arranged in a pixel field. With the voltage which a common electrode and a pixel electrode are arranged at a mutually different layer through the demarcation membrane between layers which consists of a transparent insulator, and is impressed between a common electrode and a pixel electrode The liquid crystal before making it the electric field which had a dominantly parallel component in the liquid crystal layer to the 1st substrate occur and impressing voltage was made to carry out orientation to parallel mostly to the 1st substrate.

[0015] Moreover, the 2nd liquid crystal display by this invention has the 1st transparent substrate, the 2nd transparent substrate, the liquid crystal layer pinched by these, and a light-filter layer. The light-filter layer is arranged on the 1st substrate, and a liquid crystal layer is arranged between a light-filter layer and the 2nd substrate. on the 1st [ under a light-filter layer ] substrate Two or more scanning signal electrodes and two or more video-signal electrodes which intersect them in the shape of a matrix, It has two or more TFT formed corresponding to each intersection of these electrodes. The common electrode which at least one pixel

consists of each field surrounded by two or more scanning signal electrodes and video-signal electrodes, is connected to each pixel over two or more pixels by common electrode wiring, and gives a reference potential. Connect with corresponding TFT and it has the pixel electrode which countered the common electrode and has been arranged in a pixel field. With the voltage which a common electrode and a pixel electrode are arranged at a mutually different layer through the demarcation membrane between layers which consists of a transparent insulator, and is impressed between a common electrode and a pixel electrode. The liquid crystal before making it the electric field which had a dominantly parallel component in the liquid crystal layer to the 1st substrate occur and impressing voltage was made to carry out orientation to the perpendicular mostly to the 1st substrate. Therefore, the electric field which the liquid crystal in a liquid crystal layer is automatically divided into two or more fields, break down from the electric field generated with the voltage impressed between a common electrode and a pixel electrode in the parallel direction to the substrate, and are generated in the liquid crystal layer do not influence a light-filter layer.

[0016] Moreover, in the liquid crystal display in this invention, in order to suppress decline in a numerical aperture, you may form either [ at least ] a common electrode or a pixel electrode by the transparency electric conduction film. Furthermore, a pixel electrode may be formed by the transparency electric conduction film, a common electrode may be formed with metals, such as Cr, and the shading layer which shades TFT in the same layer as this common electrode may be formed. Moreover, the liquid crystal display in this invention has the optical compensating plate of at least one sheet between the polarizing plate and the liquid crystal cell, in order to improve a viewing-angle property. Since liquid crystal has taken the homeotropic orientation at the time of no voltage impressing, as for this compensating plate, it is desirable to use a negative compensating plate optically from a viewpoint which negates change of the retardation when seeing from across. Such a compensating plate may be the film of one sheet created by method like biaxial extension, and the same effect is acquired even if it uses in piles the film which carried out 1 shaft extension as a compensating plate of one negative shaft optically substantially two or more sheets. Furthermore, although initial orientation is perpendicular orientation theoretically, when a bias comes out in a certain direction with the property of an element, in order to compensate this further, an optical anisotropy may stick a positive film.

[0017] Moreover, the liquid crystal display in this invention may prepare the electric conduction film of transparency in the 2nd liquid crystal layer and opposite side of a substrate, in order to avoid the bad influence to the display by static electricity etc. Moreover, the manufacture method of the liquid crystal display in this invention can make early liquid crystal orientation a still more positive thing by macromolecule-izing the monomer or oligomer of polymerization nature which carried out little mixture in liquid crystal, after controlling initial orientation by impressing voltage between a common electrode and a pixel electrode. Even if it drops \*\*\*\* et al. who applies voltage between a common electrode and a pixel electrode, and temperature after making a liquid crystal layer into an isotropic phase by heating in case initial orientation is controlled, it is also good to impress voltage between a common electrode and a pixel electrode at a room temperature. Moreover, before also heating the reaction of a monomer to an isotropic phase, even if it makes it start, you may make it start during heating and may make it start after cooling. When impressing voltage between a common electrode and a pixel electrode at a room temperature and controlling initial orientation, a reaction may be made to cause before voltage impression and a reaction may be made to cause after voltage impression.

[0018] Moreover, the manufacture method of the liquid crystal display in this invention uses methods, such as rubbing or optical orientation, for a substrate beforehand, the pre tilt angle according to a division configuration controls, control of initial orientation makes very reliable, and the effect which is more excellent with driver voltage when the monomer or the oligomer of polymerization nature which carried out little mixture of such orientation being confused into liquid crystal further in order to prevent macromolecule-ized is acquired. Moreover, in the case of optical orientation, division can be more certainly maintained at the time of a drive by macromolecule-izing the monomer or oligomer of polymerization nature which carried out little mixture in liquid crystal.

[0019] [Embodiments of the Invention] The form of implementation of this invention is explained with reference to drawing below. The liquid crystal display in the form of implementation of the 1st of this invention is explained at form 1 the beginning of operation using drawing 1. In addition, in drawing 1, drawing 1 (a) shows the cross section of the AA' line of the plan of drawing 1 (b). In the liquid crystal display of the form 1 of this operation, on the glass substrate 101, the gate electrode (scanning signal electrode) 102 which consists of Cr is arranged, and the gate insulator layer 104 which consists of a silicon nitride so that this gate electrode 102 may be covered is formed.

[0020] Moreover, the semiconductor film 105 which consists of amorphous silicon through the gate insulator layer 104 is arranged, and it is made to function as an active layer of TFT (TFT) on the gate electrode 102. Moreover, the drain electrode 106 and the source electrode 107 which consist of molybdenum are arranged so that it may superimpose on some patterns of the semiconductor film 105, and the protective coat 108 which consists of a silicon nitride so that these [ all ] may be covered is formed. in addition, the drain electrode 106 and the source electrode 107 -- although each is not illustrating, it is superimposed on some patterns of the semiconductor film 105 through the amorphous silicon film with which n form impurity was introduced. In addition, as shown in drawing 1 (b), the drain electrode 106 is connected to data-line (video-signal electrode) 106a. In other words, the drain electrode 106 is formed as a part of data-line 106a.

[0021] And with the form 1 of this operation, the light-filter layer 110 was divided and arranged by the shading section 111 on the protective coat 108. Moreover, the light-filter layer 110 and shading section 111 top is covered in the overcoat layer (demarcation membrane between layers) 112. This overcoat layer 112 consists of transparent insulating materials which cannot carry out a charge up easily.

[0022] And a protective coat 108, the shading section 111, and the pixel electrode 114 that connects with the source electrode

107 through the through hole formed by penetrating the overcoat layer 112 are arranged on the overcoat layer 112. Moreover, superficially, the common electrode 103 currently pulled out from common electrode wiring 103a is formed so that the pixel electrode 114 may be countered in a 1-pixel field. Here, this common electrode 103 is covered and arranged in the overcoat layer 112 on the shading section 111.

[0023] Therefore, in the form 1 of this operation, the common electrode 103 has the composition that it has been arranged on the light-filter layer 110, and the pixel electrode 114 has been arranged on the overcoat layer 112 currently formed so that the common electrode 103 and light-filter layer 110 may be covered. And it has the composition that 1 pixel was constituted, in the field inserted into the pixel electrode 114 and common electrode 103. Moreover, the orientation film 115 is formed on the overcoat layer 112 in which it was formed, the front face 114, i.e., the pixel electrode, of the active-matrix substrate which has arranged the unit pixel constituted as mentioned above in the shape of a matrix. Rubbing processing of this orientation film 115 front face is carried out.

[0024] On the other hand, the orientation film 132 is formed also in the opposite substrate 131 which consists of glass, and rubbing processing also of this orientation film 132 front face is carried out. And opposite arrangement of a glass substrate 101 and the opposite substrate 131 is carried out by orientation film 115 and orientation film 132 forming face, and it is constituted by the business by which the liquid crystal constituent layer 140 is arranged among these. Moreover, the polarizing plate 151 is formed in the field of the outside of a glass substrate 101 and the opposite substrate 131. In addition, the shading section 111 which has divided the light-filter layer 110 is formed so that it may arrange on the TFT which some of the fields become from the semiconductor film 105.

[0025] In the TFT liquid crystal display constituted as mentioned above, when electric field are not built over the liquid crystal constituent layer 140, the liquid crystal molecule in the liquid crystal constituent layer 140 will be in a state almost parallel to the extension direction of these electrodes, and is carrying out homogeneous orientation. That is, orientation of the liquid crystal molecule is carried out so that the angle with the method of the direction of the electric field formed between the direction of the major axis (optical axis) of a liquid crystal molecule, and the pixel electrode 114 and the common electrode 103 to make may become 45 degrees or more less than 90 degrees.

[0026] In addition, the orientation of the glass substrate 101 and the opposite substrate 131 by which opposite arrangement is carried out, and a liquid crystal molecule is mutually parallel. Moreover, the dielectric anisotropy of a liquid crystal molecule was made positive. Here, if voltage is impressed to the gate electrode 102 and TFT (TFT) is turned ON, voltage will be impressed to the source electrode 107 and induction of the electric field will be carried out between the pixel electrode 114 and the common electrode 103 which is carrying out opposite arrangement at this. And the liquid crystal molecule 141 will be in a state almost parallel to the direction of the electric field formed between the pixel electrode 114 and the common electrode 103 which is carrying out opposite arrangement at this by this electric field.

[0027] And the permeability of light can be changed by the movement of the liquid crystal molecule mentioned above by arranging the change transparency shaft of a polarizing plate 151 at a predetermined angle. Next, the manufacture method of the liquid crystal display in the form 1 of this operation mentioned above is explained briefly. First, by forming Cr film and carrying out patterning of this with a well-known photolithography and etching technology, as shown in drawing 2 (a), the gate electrode 102 is formed on a glass substrate 101.

[0028] Next, as shown in drawing 2 (b), the gate insulator layer 104 which consists of a silicon nitride is formed on the glass substrate 101 including the gate electrode 102 top, and the semiconductor film 105 which consists of an amorphous silicon is formed on the gate electrode 102 through this. This semiconductor film 105 should just form the film of the amorphous silicon by carrying out patterning with a well-known photolithography and well-known etching technology, after depositing an amorphous silicon on the gate insulator layer 104. Next, as shown in drawing 2 (c), the drain electrode 106 and the source electrode 107 which consist of molybdenum so that it may superimpose on some patterns of the semiconductor film 105 are formed.

[0029] Next, as shown in drawing 2 (d), a protective coat 108 is formed on the gate insulator layer 104 so that the drain electrode 106, the source electrode 107, and the semiconductor film 105 may be covered. Next, as shown in drawing 2 (e), the light-filter layer 110 and the shading section 111 are formed on this protective coat 108. Moreover, the common electrode 103 is formed simultaneously. In addition, the light-filter layer 110 consists of resin films containing red, the green or blue color, and the pigment. Moreover, what is necessary is for the shading section 111 just to consist of resin films containing the black color and the pigment. Moreover, you may make it form the shading section using a metal.

[0030] The pigment with which the optical property of requests, such as red, is obtained should just form the light-filter layer 110 using the pigment-content powder resist distributed in the photopolymer of the negative type which used the acrylic as the base. First, the resist film is formed by applying the pigment-content powder resist on a protective coat 108. Subsequently, it exposes using a photo mask so that light may hit alternatively the specified quantity region of the resist film, i.e., the pixel field arranged in the shape of a matrix. Negatives are developed after this exposure using a predetermined developer, and a predetermined pattern is formed. The light-filter layer 110 can be formed by repeating these processes the color number, for example, red and blue, and three green classification by color [ three ].

[0031] Next, as shown in drawing 3 (f), the overcoat layer 112 which consists of a transparent insulating material is formed on the light-filter layer 110 and the shading section 111 including the common electrode 103. Thermosetting resin, such as acrylic resin, should just be used for this overcoat layer 112. Moreover, you may make it use the transparent resin of a photoresist for the overcoat layer 112. Next, as shown in drawing 3 (g), the pixel electrode 114 which forms a through hole and connects with the source electrode 107 through this is formed on the overcoat layer 112. Then, after forming the orientation film 115, a liquid crystal display as shown in drawing 1 by forming the liquid crystal constituent layer 140 etc. is completed.

[0032] It was made to drive the liquid crystal molecule 141 arranged at the top by forming electric field between the pixel electrode 114 arranged on the light-filter layer 110, and the common electrode 103 which is carrying out opposite arrangement at this with the form 1 of this operation, as shown above. Therefore, according to the form of this operation, the light-filter layer 110 and the liquid crystal constituent layer 140 were arranged on both sides of the pixel electrode 114 and the common electrode 103. Therefore, the electric field for moving the liquid crystal molecule 141 by the pixel electrode 114 and the common electrode 103 do not affect the light-filter layer 110 at all. Moreover, although the liquid crystal constituent layer 140 is formed on the overcoat layer 112 on the common electrode 103, the charge up of the overcoat layer 112 is hardly carried out.

[0033] According to the form 1 of this operation, since the state where unnecessary electric field are built up and down always is suppressed by the above thing, unlike the former, by it, the liquid crystal constituent layer 140 has the structure of being hard to cause degradation of a display property. Moreover, since the pixel electrode 114, the common electrode 103, and common electrode wiring 103a are formed through the overcoat layer 112, it does not happen that the pixel electrode 114 and common electrode wiring 103a contact.

[0034] The liquid crystal display in the form of implementation of the 2nd of this invention is explained at form 2 the beginning of operation using drawing 4. In addition, in drawing 4, drawing 4 (a) shows the cross section of BB' line of the plan of drawing 4 (b). In the liquid crystal display of the form 2 of this operation, on the glass substrate 401, the gate electrode 402 which consists of Cr is arranged, and the gate insulator layer 404 which consists of a silicon nitride so that this gate electrode 402 may be covered is formed. Moreover, the semiconductor film 405 which consists of amorphous silicon through the gate insulator layer 404 is arranged, and it is made to function as an active layer of TFT on the gate electrode 402.

[0035] Moreover, the drain electrode 406 and the source electrode 407 which consist of molybdenum are arranged so that it may superimpose on some patterns of the semiconductor film 405, and the protective coat 408 which consists of a silicon nitride so that these [ all ] may be covered is formed. In addition, the drain electrode 406 and the source electrode 407 -- although each is not illustrating, it is superimposed on some patterns of the semiconductor film 405 through the amorphous silicon film with which n form impurity was introduced. In addition, as shown in drawing 4 (b), the drain electrode 406 is connected to data-line 406a. The above thing is the same as that of the form 1 of operation mentioned above.

[0036] And with the form 2 of this operation, the light-filter layer 410 was arranged on the protective coat 408. Moreover, the light-filter layer 410 is covered in the overcoat layer 412. This overcoat layer 412 consists of transparent material which cannot carry out a charge up easily, such as acrylic resin. And it connects with drawer electrode 407a pulled out from the source electrode 407, and the pixel electrode 414 is arranged on the overcoat layer 412. This pixel electrode 414 is connected to drawer electrode 407a through a protective coat 408, the shading section 411, and the through hole that penetrates the overcoat layer 412. Moreover, this pixel electrode 414 consists of transparent electrodes, such as ITO (In<sub>2</sub>O<sub>3</sub>:Sn), and it is arranged in the center section so that a 1-pixel field may be superficially divided mostly into a half.

[0037] Moreover, the common electrode wiring 403 is formed so that the 1-pixel field may be enclosed. Moreover, this common electrode wiring 403 is covered and arranged in the overcoat layer 412 on the light-filter layer 410. And when it sees from the upper part, this common electrode wiring 403 has been arranged so that TFT which consists of the drain electrode 406 arranged in the lower layer, data-line 406a, a source electrode 407, a gate electrode 402, and them may be hidden, and serves as the shading layer.

[0038] In addition, the orientation film 415 is formed on the overcoat layer 412 in which it was formed, the front face 414, i.e., the pixel electrode, of the active-matrix substrate which has arranged the unit pixel constituted as mentioned above in the shape of a matrix. Rubbing processing of this orientation film 415 front face is carried out. On the other hand, the orientation film 432 is formed also in the opposite substrate 431 which consists of glass, and rubbing processing also of this orientation film 432 front face is carried out. And opposite arrangement of a glass substrate 401 and the opposite substrate 431 is carried out by orientation film 415 and orientation film 432 forming face, and it is constituted by the business by which the liquid crystal constituent layer 440 is arranged among these. Moreover, the polarizing plate 451 is formed in the field of the outside of a glass substrate 401 and the opposite substrate 431.

[0039] Thus, also in the gestalt 2 of this operation, the common electrode wiring 403 has the composition that it has been arranged on the light-filter layer 410, and the pixel electrode 414 has been arranged on the overcoat layer 412 currently formed so that the common electrode wiring 403 and light-filter layer 410 may be covered, like the gestalt 1 of operation mentioned above. In this case, the common electrode wiring 403 serves also as the common electrode in the gestalt 1 of operation mentioned above. And with the gestalt 2 of this operation, 1 pixel consists of fields enclosed by the common electrode wiring 403 formed in the shape of a grid, and the pixel electrode 414 was arranged so that 1 pixel might be divided into a half through the center section.

[0040] In the TFT liquid crystal display constituted as mentioned above, when electric field are not impressed to the liquid crystal constituent layer 440, the liquid crystal molecule in the liquid crystal constituent layer 440 is in the state almost parallel to the extension direction of these electrodes. That is, orientation of the liquid crystal molecule is carried out so that the angle with the method of the direction of the electric field formed between the direction of the major axis (optical axis) of a liquid crystal molecule, and the pixel electrode 414 and the common electrode wiring 403 to make may become 45 degrees or more less than 90 degrees. In addition, the orientation of the glass substrate 401 and the opposite substrate 431 by which opposite arrangement is carried out, and a liquid crystal molecule is mutually parallel. Moreover, the dielectric anisotropy of a liquid crystal molecule was made positive.

[0041] Here, if voltage is impressed to the gate electrode 402 and TFT (TFT) is turned ON, voltage will be impressed to the source electrode 407 and induction of the electric field will be carried out to the pixel electrode 414 and this between the common electrode wiring 403 which is carrying out opposite arrangement. And the liquid crystal molecule 441 will be in the pixel

electrode 414 and a state almost parallel to the direction of the electric field formed in this between the common electrode wiring 403 which is carrying out opposite arrangement by this electric field. And the permeability of light can be changed by the movement of the liquid crystal molecule mentioned above by arranging the change transparency shaft of a polarizing plate 451 at a predetermined angle.

[0042] It was made to drive the liquid crystal molecule 441 arranged on them by forming electric field in the pixel electrode 414 arranged on the light-filter layer 410, and this also with the form 2 of this operation between the common electrode wiring 403 which is carrying out opposite arrangement, as shown above. That is, also in the form 2 of this operation, the light-filter layer 410 and the liquid crystal constituent layer 440 were arranged on both sides of the pixel electrode 414 and the common electrode wiring 403. Therefore, the electric field for moving the liquid crystal molecule 441 with the pixel electrode 414 and the common electrode wiring 403 do not affect the light-filter layer 410 at all.

[0043] Moreover, although the liquid crystal constituent layer 440 is formed on the overcoat layer 412 on the common electrode wiring 403, the charge up of the overcoat layer 412 is hardly carried out. According to the form 2 of this operation, since the state where unnecessary electric field are built up and down always is suppressed by the above thing, unlike the former, by it, the liquid crystal constituent layer 440 has the structure of being hard to cause degradation of a display property. Moreover, since the pixel electrode 414 and the common electrode wiring 403 are formed through the overcoat layer 412, it does not happen that the pixel electrode 414 and the common electrode wiring 403 contact. and the form 2 of this operation -- getting twisted -- since the common electrode wiring 403 serves also as the shading layer as mentioned above, the manufacturing process of a light-filter layer can be simplified

[0044] In addition, in the gestalten 1 and 2 of the above-mentioned implementation, in one pixel, although a common electrode and 1 set of pixel electrode were prepared, there is nothing that is restricted to this. You may make it a common electrode prepare two or more sets of rough electrodes in one pixel field. For example, you may make it form these electrodes and arrange face to face at Kushigata. By doing in this way, since distance between a pixel electrode and a common electrode can be shortened even when one pixel is large, voltage impressed in order to make liquid crystal drive can be made small.

[0045] The liquid crystal display in the gestalt 3 of operation, next the gestalt of implementation of the 3rd of this invention is explained using drawing 5. In addition, in drawing 5, (a) is the plan of some pixels of a liquid crystal display, and (b) and (c) express the cross section of A-A' and a B-B' line, respectively. The point that the gate electrode 505 is formed on a glass substrate 501, the TFT which consists of a drain electrode 506 and a source electrode 507 through the gate insulator layer 504 is formed, and the passivation film 512 is formed on it in the liquid crystal display of this 3rd operation gestalt is the same as the gestalt 1 of operation. And the light-filter layer 517 is formed on it, and it is covered in the 1st overcoat layer 513 so that it may be covered. The transparent insulating material which cannot carry out a charge up easily constitutes this overcoat layer 513.

[0046] And the pixel electrode 508 linked to the source electrode 507 is arranged on the 1st overcoat layer 513 through the through hole formed by penetrating the passivation film 512 and the 1st overcoat layer 513. The 2nd overcoat layer 514 is formed so that these may furthermore all be covered, and the common electrode 509 currently pulled out by common electrode wiring is formed on it. In order to make it the liquid crystal layer 515 cost the electric field between the common electrode 509 and the pixel electrode 508 here as for the 2nd overcoat layer 513, it is desirable to thin-film-ize to about 0.1-1 micrometer, and to use material with a still higher dielectric constant.

[0047] Therefore, in the gestalt 3 of this operation, it has the composition that the pixel electrode 508 has been arranged on the 1st overcoat 513 on a light filter 517, and the common electrode 509 has been arranged on the 2nd overcoat layer currently formed so that these may be covered. And it has the composition that 1 pixel was constituted, in the field inserted into the pixel electrode 508 and common electrode 509. Moreover, the common electrode 509 is arranged on wiring and TFT, and serves as shading like the 2nd operation gestalt.

[0048] Moreover, it is the same as that of the 1st operation form to change the permeability of light by driving liquid crystal using the longitudinal direction electric field generated in the pixel electrode which formed the orientation film in the front face of the active-matrix substrate which has arranged on a matrix the unit pixel constituted as mentioned above, and the front face of an opposite substrate, performed rubbing processing in the predetermined direction, and has been arranged on an active-matrix substrate, and common inter-electrode. In addition, the liquid crystal layer 515 is pinched between the opposite substrate 516 and the 2nd overcoat layer 514.

[0049] Next, the manufacture method of the liquid crystal display in this 3rd operation form mentioned above is explained briefly. As shown in drawing 6 (a), it is the same as that of the operation form 1 to form TFT on a glass substrate 501, and to form a light filter using photosensitive pigment-content powder type acrylic resin etc., after depositing the passivation film 512 which protects them. Next, like drawing 6 (b), the 1st overcoat layer is formed using transparent photosensitive acrylic resin etc., opening of the through hole 518 is carried out, and opening also of the through hole on the passivation film 512 is carried out simultaneously.

[0050] Next, as shown in drawing 6 (c), the pixel electrode 508 which connects with the source electrode 508 through a through hole 518 is formed on the 1st overcoat layer by ITO etc. Next, as shown in drawing 6 (d), the 2nd overcoat film is formed. In the 2nd overcoat film, when forming a photosensitive organic film etc. by the applying method, flattening of the through hole 508 is carried out, and a pixel electrode, common inter-electrode short-circuit, etc. are lost, and it is desirable.

[0051] And as shown in drawing 6 (e), the common electrode 509 is formed with chromium molybdenum etc. Since the state where unnecessary electric field are applied up and down by the liquid crystal layer 515 by the above thing always according to this operation form 3 is suppressed, unlike the former, it has the structure of being hard to cause degradation of a display. Moreover, since flattening of the through hole on the 1st overcoat layer is carried out with the 2nd overcoat, it has a pixel electrode and structure whose common inter-electrode short-circuit decreases.



[0052] The liquid crystal display in the form 4 of operation, next the form of implementation of the 4th of this invention is explained using drawing 7. In addition, in drawing 7, (a) is the plan of some pixels of a liquid crystal display, and (b) and (c) express the cross section of A-A' and a B-B' line, respectively. The point that the gate electrode 705 is formed on a TFT glass substrate, the TFT which consists of a drain electrode 706 and a source electrode 707 is formed, and the passivation film 712 is formed on it through the gate insulator layer 704 in the liquid crystal display of the form 4 of this operation is the same as the 1st operation form.

[0053] Moreover, the light-filter layer 717 is formed on it, and the 1st overcoat layer 713 is covered so that it may be covered. The transparent insulating material which cannot carry out a charge up easily constitutes this overcoat layer 713. And the common electrode 709 currently pulled out by common electrode wiring is formed on the passivation film 712 and the 1st overcoat layer 713. The pixel electrode 708 linked to the source electrode 707 is arranged through the through hole which the 2nd overcoat layer 714 was formed so that these might furthermore all be covered, and was formed by penetrating the 2nd overcoat layer.

[0054] In order to make it the liquid crystal layer 715 cost the electric field between a common electrode and a pixel electrode here as for the 2nd overcoat layer, it is desirable to thin-film-ize to about 0.1-1 micrometer, and to use material with a still higher dielectric constant. Therefore, in this 4th operation form, it has the composition that the common electrode 709 has been arranged on the 1st overcoat 713 on a light filter 717, and the pixel electrode 708 has been arranged on the 2nd overcoat layer currently formed so that these may be covered. And it has the composition that 1 pixel was constituted, in the field inserted into the pixel electrode 708 and common electrode 709. Moreover, the common electrode 709 is arranged on wiring and TFT, and serves as shading like the 2nd operation form.

[0055] Moreover, it is the same as that of the 1st operation form to change the permeability of light by driving liquid crystal using the longitudinal direction electric field generated in the pixel electrode which formed the orientation film in the front face of the active-matrix substrate which has arranged on a matrix the unit pixel constituted as mentioned above, and the front face of an opposite substrate, performed rubbing processing in predetermined one quantity, and has been arranged on an active-matrix substrate, and common inter-electrode. In addition, the liquid crystal layer 715 is pinched between the opposite substrate 716 and the 2nd overcoat layer 714.

[0056] Next, the manufacture method of the liquid crystal display in this 4th operation form mentioned above is explained briefly. As shown in drawing 8 (a), it is the same as that of the 1st operation form to form TFT on a glass substrate 710, and to form a light filter using photosensitive pigment-content powder type acrylic resin etc., after depositing the passivation film 712 which protects them. Next, like drawing 8 (b), after applying the 1st overcoat layer, pattern formation of the common electrode 709 is carried out with metals, such as chromium molybdenum.

[0057] Next, as shown in drawing 8 (c), after applying the 2nd overcoat film, the through hole 718 which penetrates the overcoat film and passivation film of the 1st and 2 is formed. Finally, as shown in drawing 8 (d), the pixel electrode 708 which connects with the source electrode 707 through a through hole 718 is formed on the 2nd overcoat layer by ITO etc.

[0058] According to this operation form 4, since the state where unnecessary electric field are built up and down always is suppressed by the above thing, unlike the former, by it, the liquid crystal layer 715 has the structure of being hard to cause degradation of a display property. Moreover, since it carries out by putting in block patterning of the overcoat layer of the 1st and 2 and a through hole is formed, a manufacturing process is shortened compared with the 3rd operation form.

[0059] The liquid crystal display in the form 5 of operation, next the form of operation of the 5th of this invention is explained using drawing 9. In addition, in drawing 9, drawing 9 (a) shows the cross section of the AA' line of the plan of drawing 9 (b). The perpendicular orientation film 915 is formed on the overcoat layer 912 in which it was formed, the front face 914, i.e., the pixel electrode, of the active-matrix substrate which has arranged the unit pixel constituted like the form 1 of operation in the shape of a matrix. As for this orientation film 915 front face, rubbing or optical orientation processing is performed if needed.

[0060] On the other hand, the perpendicular orientation film 932 is formed also in the opposite substrate 931 which consists of a transparency substrate, and rubbing or optical orientation processing is performed also for the front face of this orientation film 932 if needed. Moreover, you may prepare transparency electric conduction films, such as ITO, in the orientation film of an opposite substrate, and the front face of an opposite side in order to prevent deterioration of the quality of image by static electricity. Opposite arrangement of a substrate 901 and the opposite substrate 931 is carried out by orientation film 915 and orientation film 932 forming face, and the liquid crystal layer 940 is arranged among these. Moreover, when using it with a penetrated type, the polarizing plate 951 is formed in the field of the outside of a substrate 901 and the opposite substrate 931. In addition, the shading section 911 which has divided the light-filter layer 910 is formed so that it may arrange on the TFT which some of the fields become from the semiconductor film 905.

[0061] In the active matrix liquid crystal display constituted as mentioned above, when electric field are not built over the liquid crystal layer 940, orientation of the liquid crystal molecule in the liquid crystal layer 940 is mostly carried out to the substrate at the perpendicular. The dielectric constant anisotropy of liquid crystal is made positive. Here, if voltage is impressed to the gate electrode 902 and TFT (TFT) is turned ON, voltage will be impressed to the source electrode 907 and induction of the electric field will be carried out between the pixel electrode 914 and the common electrode 903 which is carrying out opposite arrangement at this. And the liquid crystal molecule 941 will fall by this electric field in the state almost parallel to a direction of a substrate, i.e., direction, of the electric field formed between the pixel electrode 914 and the common electrode 903 which is carrying out opposite arrangement at this. Moreover, at this time, since it is not completely parallel to a substrate, the direction of electric field is divided into a 2-way, and an inter-electrode liquid crystal molecule falls.

[0062] Thus, by the method of this invention, even if it does not carry out adding processing to an orientation film specially, the direction where liquid crystal falls automatically can be divided, and wide-field-of-view cornification can be attained. However,

each field which falls in the direction in which the directions of liquid crystal differ is controlled only by the direction of electric field, and is not divided clearly. For this reason, when the orientation state of liquid crystal is bad, the boundary becomes the cause of moving in the inside of a pixel and generating a poor display by the display screen. Then, in order to control more completely the boundary which changes the direction where the liquid crystal falls, you may make it fix, as the boundary is shown below.

[0063] As shown in drawing 10, what is necessary is just made to perform different rubbing processing for every field as the one method. First, as shown in drawing 10 (a), bordering on the boundary in a pixel, the resist pattern 1001 is formed on the perpendicular orientation film 915 of one field, and a rubbing roll 1010 is moved in the predetermined direction in this state. It means that rubbing processing of the field with which the resist pattern 1001 of the perpendicular orientation film 915 is not covered had been carried out in the predetermined direction by this. However, rubbing processing of the field covered by the resist pattern 1001 is not carried out here.

[0064] Next, after removing the resist pattern 1001, as shown in drawing 10 (b), the resist pattern 1002 is formed on the perpendicular orientation film 915 of the field of another side bordering on the boundary in a pixel. That is, the resist pattern 1002 is formed so that the field by which rubbing processing was already carried out may be covered. And a rubbing roll 1010 is moved in the direction opposite to \*\*\*\* in this state. It means that rubbing processing of the field with which the resist pattern 1002 of the perpendicular orientation film 915 is not covered had been carried out in the different direction from the field by which rubbing processing was already carried out by this. And in this processing, since it is covered by the resist pattern 1002, rubbing processing of the field by which rubbing processing was already carried out is not carried out again.

[0065] And after removing the resist pattern 1002, as the perpendicular orientation film 932 by the side of the opposite substrate 931 is processed similarly and shown in drawing 10 (c), \*\*\*\* which arranges the liquid crystal layer 940 is good among them. It comes to break down in the direction in which the liquid crystal molecules 941 differ from the liquid crystal layer 940 bordering on a boundary these results. That is, a division field is fixable by having mentioned above.

[0066] Moreover, in order to control more completely the boundary which changes the direction where the liquid crystal falls, you may make it fix, as the boundary is shown below. The optical orientation film with which the direction of orientation becomes settled by irradiating the light which polarized is used for these 2nd method. If it explains to a detail more and the perpendicular orientation film 915 which consists of an optical orientation film will be hereafter formed first as shown in drawing 11 (a), the mask 1101 which shades one field bordering on a predetermined boundary will be arranged, and the light 1110 which polarized from across in this state will be irradiated from the upper part. It means that the orientation state had been prescribed to the field with which the mask 1101 of the perpendicular orientation film 915 is not covered by this. However, as for the field which has a mask 1101 in the upper part, the orientation state is not specified here.

[0067] Next, as shown in drawing 11 (b), a mask 1102 is arranged on the perpendicular orientation film 915 of the field of another side bordering on the boundary in a pixel. That is, a mask 1102 is arranged so that the field where the orientation state was already specified may be covered. And the light which polarized from [ of an opposite side ] across with \*\*\*\* is shortly irradiated from the upper part in this state. It means that the predetermined orientation state had been prescribed to the field with which the mask 1102 of the perpendicular orientation film 915 is not covered by this. It means that the orientation state was specified in the direction in which the field with which the mask 1102 of the perpendicular orientation film 915 is not covered differs from the field where the orientation state was already specified by this. And by this processing, since the field where the orientation state was already specified has a mask 1102 in the upper part and light is not irradiated, an orientation state is not specified again.

[0068] And as shown in drawing 11 (c), \*\*\*\* to which the perpendicular orientation film 932 by the side of the opposite substrate 931 is processed similarly, and arranges the liquid crystal layer 940 among them is good. It comes to break down in the direction in which the liquid crystal molecules 941 differ from the liquid crystal layer 940 bordering on a boundary these results. That is, a division field is fixable by having mentioned above. In addition, what is necessary is just to use the matter which has the functional group which can control the orientation of liquid crystal by polarization like a cinnamic-acid machine as the optical orientation film, or a macromolecule in which a sensitization machine carries out a polymerization by polarization irradiation which is indicated by DAIJIE stove technical \*\*\*\*\* (\*\*/IDW'96DigestofTechnicalPapers) P.337 of E-em ERUSHI-dee'96/eye dee W'96. [ AM-LCD ]

[0069] Furthermore, when at least two methods mentioned above cannot suppress disorder of the orientation of liquid crystal, you may make it make the orientation state of liquid crystal memorize using organic polymeric materials. First, this introduces the monomer and oligomer of the material into liquid crystal, subsequently to the predetermined direction state of orientation carries out liquid crystal, it is in the state, and by irradiating ultraviolet rays etc., carries out the polymerization of the monomer and should just be taken as polymer. Consequently, it will be in the state where the orientation state of liquid crystal was memorized.

[0070] In addition, other components may be included, as long as it can also use any, such as a photoresist monomer, thermosetting monomers, or these oligomer, and these are included as the monomer made into the organic polymeric materials mentioned above, and oligomer. "The photoresist monomer or oligomer" used for this invention has the desirable latter especially from the ease of operation including the ultraviolet-rays hardening monomer which reacts not only by what reacts by the visible ray but by ultraviolet rays.

[0071] Moreover, although these high molecular compounds have the monomer which shows mesomorphism, a liquid crystal molecule containing oligomer, and analogous structure, since they are not necessarily what is used in order to carry out orientation of the liquid crystal, they may have flexibility which has an alkylene chain. Moreover, you may be the thing of single functionality and the thing of two functionality, the monomer which has polyfunctional [ of three or more organic functions ] are sufficient. What is necessary is just to use the next thing, for example as the light used by this invention, or an ultraviolet-rays hardening

monomer.

[0072] first To 2-ethyl, KISHIRU acrylate, butyl ethyl acrylate, butoxy ethyl acrylate, 2-cyano ethyl acrylate, benzyl acrylate, cyclohexyl acrylate, 2-hydroxypropyl acrylate, 2-ethoxy ethyl acrylate, N, N-ethylamino ethyl acrylate, N, N-dimethylamino ethyl acrylate, dicyclopentanyl acrylate, dicyclopentenylacrylate, glycidyl acrylate, tetrahydrofurfuryl acrylate, ISOBO nil acrylate, isodecyl acrylate, laurylacrylate, Morpholine acrylate, phenoxy ethyl acrylate, phenoxy diethylene-glycol acrylate. Single organic-functions acrylate compounds, such as a 2, 2, and 2-truffe RUORO ethyl acrylate, 2, 2, 3 and 3, and 3-pentafluoro propyl bitter taste rate, 2, 2 and 3, 3-tetrafluoropropylacrylate, 2, 2, 3, 4 and 4, and 4-hexafluoro butyl acrylate, can be used.

[0073] moreover 2-ethylhexyl methacrylate, butyl ethyl methacrylate, butoxyethylmethacrylate, 2-cyano ethyl methacrylate, benzyl methacrylate, cyclohexyl methacrylate, 2-hydroxypropyl methacrylate, 2-ethoxy ethyl acrylate, N, and N-diethylamino ethyl methacrylate, N, N-dimethylaminoethyl methacrylate, dicyclopentanyl methacrylate, dicyclopentenylmethacrylate, glycidyl methacrylate, tetrahydrofurfuryl methacrylate, ISOBO nil methacrylate, isodecyl methacrylate, Lauryl methacrylate, morpholine methacrylate, phenoxy ethyl methacrylate, phenoxy diethylene-glycol methacrylate, 2 and 2, 2-trifluoroethylmethacrylate, 2, 2 and 3, 3-tetrafluoro propyl methacrylate, 2, 2, 3, Single organic-functions methacrylate compounds, such as 4, 4, and 4-hexafluoro butyl methacrylate, can be used.

[0074] Furthermore A - screw acryloyloxy diphenyl-ether, and 4 and 4'-biphenyl diacrylate, diethylstilbestrol diacrylate, 1, 4-screw acryloyloxy benzene, 4, and 4 '4, 4'-screw acryloyloxy diphenylmethane, 3, 9-screw [1, 1-dimethyl-2-acryloyloxyethyl]-SUPIRO [ 2, 4, 8, and 10-tetrapod ] [ 5, 5] undecane, alpha, alpha'-screw [4-acryloyloxy phenyl]-1, 4-diisopropylbenzene, 1,4-bisacryloyloxytetrafluorobenzene, 4, 4'-bisacryloyloxyactafluorobiphenyl, diethylene glycol diacrylate, 1, 4-butanediol diacrylate, 1, 3-butylene-glycol diacrylate, dicyclopentanyl diacrylate, glycerol diacrylate, 1, 6-hexanediol diacrylate, neopentyl glycol diacrylate, tetraethylene glycol diacrylate, trimethylolpropane triacrylate, pentaerythritol tetraacrylate, a pentaerythritol thoria chestnut rate, A ditrimethylolpropanetetraacrylate, dipentaerythritol hexaacrylate, dipentaerythritolmonohydroxypentaacrylate, 4, and 4'-diacryloyl oxy-stilbene, 4,4'-diacryloyl oxydimethylstilbene, 4, A - diacryloyl oxy-dibutyl stilbene, and - diacryloyl oxy-diethyl stilbene, and 4 '4, 4'-diacryloyl oxy-dipropyl stilbene, 4, and 4 '4, 4'-diacryloyl oxy-dipentyl stilbene, 4, A - diacryloyl-oxy-dihexylstilbene, and 4 '4, 4'-diacryloyl oxy-difluoro stilbene, 2, 2, 3, 3 and 4, 4-hexafluoro pentanediol -1, 5-diacrylate, 1, 1, 2, 2 and 3, the 3-hexafluoro propyl -1, Polyfunctional acrylate compounds, such as 3-diacrylate and urethane acrylate oligomer, can be used.

[0075] Further again Diethylene-glycol dimethacrylate, 1, 4-butanediol dimethacrylate, 1, 3-butylene-glycol dimethacrylate, dicyclopentanyl dimethacrylate, glycerol dimethacrylate, 1, 6-hexanediol dimethacrylate, Neopentyl glycol dimethacrylate, tetraethylene-glycol dimethacrylate, trimethylolpropanetrimethacrylate, pentaerythritol tetrapod methacrylate, pentaerythritol trimethacrylate, Ditrithymethylolpropane tetra methacrylate, dipentaerythritol hexamethacrylate, dipentaerythritolmonohydroxypentamethacrylate, 2, 2, 3, 3 and 4, 4-hexafluoro pentanediol -1, 5-dimethacrylate, Although there are polyfunctional methacrylate compounds, such as urethane methacrylate oligomer, other styrene, amino styrene, vinyl acetate, etc., it is not limited to this.

[0076] Moreover, in this invention, since the driver voltage of each element of a liquid crystal display is influenced by the interface interaction of polymeric materials and liquid crystal material, it may be a high molecular compound containing a fluorine element. As such a high molecular compound The KISAFURUORO propyl -1, 3-diacrylate, 2 and 2, 2-truffe RUORO ethyl acrylate, 2, 2, 3, 3, to 2, 2, 3, 3, 4, and 4- to KISAFURUORO pentanediol -1, 5-diacrylate, 1, 1, 2, 2 and 3, and 3- KISAFURUO lob chill acrylate, 2 and 2, 2-trifluoroethylmethacrylate, 2, 2, 3, to 3-pentafluoro propylacrylate, 2, 2 and 3, 3-tetrafluoropropylacrylate, 2, 2, 3, 4 and 4, and 4- Although the high molecular compound compounded from the compound containing 3-tetrafluoro propyl methacrylate, 2, 2, 3, 4 and 4, 4-hexafluoro butyl methacrylate, urethane acrylate oligomer, etc. is mentioned, it is not limited to this. When using light or an ultraviolet-rays hardening monomer as a high molecular compound used for this invention, the initiator for light or ultraviolet rays can also be used.

[0077] As this initiator, various things are usable. for example 2 and 2-diethoxy acetophenone, Acetophenone systems, such as 2-hydroxy-2-methyl-1-phenyl-1-ON, 1-(4-isopropyl phenyl)-2-hydroxy-isobutane-1-ON, and 1-(4-dodecyl phenyl)-2-hydroxy-isobutane-1-ON, Benzoin systems, such as a benzoin methyl ether, benzoin ethyl ether, and a benzyl dimethyl ketal, Benzophenone systems, such as benzophenone, benzoylbenzoic-acid, 4-phenylbenzo phenon, 3, and 3-dimethyl-4-methoxybenzophenone, Thioxanthone systems, such as thioxanthone, 2-crawl thioxanthone, and 2-methylthioxanthone, a diazonium salt system, a sulfonium salt system, an iodonium-salt system, a selenium salt system, etc. can be used.

[0078] And the permeability of light can be changed by the movement of the liquid crystal molecule mentioned above by arranging the polarization transparency shaft of a polarizing plate 951 at a predetermined angle. Moreover, although it becomes no MARIBURAKKUMO-DO when a polarization transparency shaft is made to intersect perpendicularly, since observation angle dependence of the retardation of early liquid crystal orientation is lost, it can use combining the compensation film of one negative shaft, and the compensation film of one positive shaft. While the observation angular dependence of a black state is lost and quality of image improves by this, wide-field-of-view cornification can be attained.

[0079] Since the state where unnecessary electric field are applied up and down by the liquid crystal layer 940 always is suppressed by the above thing according to the form 5 of this operation, unlike the former, it has the structure of being hard to cause degradation of a display property. Moreover, from the state in which the liquid crystal molecule carried out orientation to the perpendicular mostly to the substrate, for the composition which falls by electric field, there is also no coloring when a liquid crystal molecule like before observes from across compared with the composition rotated in a field only parallel to a substrate, and a large angle-of-visibility property is given.

[0080]

[Example] Hereafter, this invention is explained more to a detail using an example.

(Example 1) Membrane formation process and lithography process were repeated and the substrate which has an amorphous silicon TFT array (TFT) was produced on the glass substrate. This TFT consists of the gate-chromium layer, a silicon-nitride-gate insulating layer, an amorphous silicon-semiconductor layer, and a drain source-molybdenum layer from the substrate side (refer to drawing 2 (c)). The protective coat which consists of a silicon nitride so that these may be covered was formed. Next, the green light-filter layer was formed by photo lithography after an application and stoving on the protective coat, for example. The operation same about red and a blue light-filter layer was repeated, the light-filter layer was created, and the shading section was similarly formed using the resin containing the black pigment.

[0081] After creating a common electrode using chromium, the overcoat layer which consists of acrylic resin was applied, and it heated at 200 degrees C for 1 hour. Next, the through hole was formed to the source electrode using photo lithography and etching. The pixel electrode was formed using chromium, SE1211 by the Nissan chemistry company was applied as a perpendicular orientation film, and it heated at 200 degrees C for 1 hour. SE1211 by the Nissan chemistry company was applied to the glass substrate which formed ITO at the rear face as a perpendicular orientation film, 200 degrees C and heating of 1 hour were performed, and it considered as the opposite substrate.

[0082] It piled up through spacer material so that the field which applied the sealant to the periphery of a substrate and applied the orientation film might face each other, and 160 degrees C of sealants were stiffened by heating for 3 hours. Since the opposite substrate was an entire solid substrate at this time, eye doubling with a high precision was unnecessary. The dielectric constant anisotropy poured in the positive nematic liquid crystal, and closed the injected hole by optical hardening resin.  $\Delta n$  and the size of a liquid crystal layer were equal, and after [ which becomes reverse / a sign ] sticking a negative compensation film optically, the polarizing plate was stuck so that a vertical substrate and the transparency shaft might cross at right angles. Thus, when the viewing-angle property of the obtained panel was measured, there is no tone reversal and the outstanding viewing-angle property with the very large field of high contrast was acquired. There is no coloring when seeing from [ which is seen by the panel especially driven by the usual longitudinal direction electric field ] across, color nonuniformity etc. was not seen at all, but the outstanding viewing-angle property was shown.

[0083] (Example 2) Like the example 1, on the glass substrate, membrane formation process and lithography process were repeated and the amorphous silicon TFT array (TFT) was created. This TFT consists of the gate-chromium layer, a silicon-nitride-gate insulating layer, an amorphous silicon-semiconductor layer, and a drain source-molybdenum layer from the substrate side like the example 1. The protective coat which consists of a silicon nitride was formed so that these might be covered, and red, blue, and the green light-filter layer were formed like the example 1. After creating a common electrode using chromium, the overcoat layer which consists of acrylic resin was applied, and it heated at 200 degrees C for 1 hour. Next, the through hole was formed to the source electrode and the pixel electrode was formed using ITO. Completely like the example 1, SE1211 by the Nissan chemistry company was applied as a perpendicular orientation film, and it heated at 200 degrees C for 1 hour. SE1211 by the Nissan chemistry company was applied to the glass substrate which formed ITO at the rear face as a perpendicular orientation film, 200 degrees C and heating of 1 hour were performed, and it considered as the opposite substrate.

[0084] It piled up through spacer material so that the field which applied the sealant to the periphery of a substrate and applied the orientation film might face each other, and 160 degrees C of sealants were stiffened by heating for 3 hours. Since the opposite substrate was an entire solid substrate at this time, eye doubling with a high precision was unnecessary. The dielectric constant anisotropy poured in the positive nematic liquid crystal, and closed the injected hole by optical hardening resin.  $\Delta n$  and the size of a liquid crystal layer were equal, and after [ which becomes reverse / a sign ] sticking a negative compensation film optically, the polarizing plate was stuck so that a vertical substrate and the transparency shaft might cross at right angles.

[0085] Thus, when the viewing-angle property of the obtained panel was measured, there is no tone reversal and the outstanding viewing-angle property with the very large field of high contrast was acquired. There is no coloring when seeing from [ which is seen by the panel especially driven by the usual longitudinal direction electric field ] across, color nonuniformity etc. was not seen at all, but the outstanding viewing-angle property was shown. In addition, since the pixel electrode was created by ITO, the numerical aperture was high and the bright display was obtained.

[0086]

[Effect of the Invention] In the liquid crystal display which has the 1st transparent substrate, the 2nd transparent substrate, the liquid crystal layer pinched by these, and a light-filter layer in this invention as explained above The light-filter layer is arranged on the 1st substrate, and a liquid crystal layer is arranged between a light-filter layer and the 2nd substrate. on the 1st [ under a light-filter layer ] substrate Two or more scanning signal electrodes and two or more video-signal electrodes which intersect them in the shape of a matrix, It has two or more TFT formed corresponding to each intersection of these electrodes. The common electrode which at least one pixel consists of each field surrounded by two or more scanning signal electrodes and video-signal electrodes, is connected to each pixel over two or more pixels by common electrode wiring, and gives a reference potential, It connects with corresponding TFT and has the pixel electrode which countered the common electrode and has been arranged in a pixel field. a common electrode and a pixel electrode It is arranged between a light-filter layer and a liquid crystal layer, and a common electrode and a pixel electrode with the voltage which is arranged at a mutually different layer through the demarcation membrane between layers which consists of a transparent insulator, and is impressed between a common electrode and a pixel electrode It was made for the electric field which had a dominantly parallel component in the liquid crystal layer to the 1st substrate to occur.

[0087] Therefore, the liquid crystal in a liquid crystal layer is rotated in respect of being almost parallel to a substrate by the

electric field generated with the voltage impressed between a common electrode and a pixel electrode, and the electric field generated in the liquid crystal layer do not influence a light-filter layer. Consequently, since the charge up partially generated in a light-filter layer can be suppressed according to this invention, generating of the color nonuniformity of the liquid crystal display of a multicolor display can be suppressed.

---

[Translation done.]

\* NOTICES \*

Japan Patent Office is not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

CLAIMS

---

[Claim(s)]

[Claim 1] It has the following. the aforementioned common electrode and the aforementioned pixel electrode It is arranged between the aforementioned light-filter layer and the aforementioned liquid crystal layer, and the aforementioned common electrode and the aforementioned pixel electrode are arranged at a mutually different layer through the demarcation membrane between layers which consists of a transparent insulator. With the voltage impressed between the aforementioned common electrode and the aforementioned pixel electrode, the electric field which had a dominantly parallel component in the aforementioned liquid crystal layer to the 1st substrate of the above occur. And the liquid crystal display which has the 1st transparent substrate, the 2nd transparent substrate and the liquid crystal layer pinched by these characterized by the liquid crystal before voltage impresses carrying out orientation to parallel mostly to the 1st substrate, and a light-filter layer. The aforementioned light-filter layer is arranged on the substrate of the above 1st, the aforementioned liquid crystal layer is arranged between the aforementioned light-filter layer and the 2nd substrate of the above, and it is two or more scanning-on substrate of the above 1st under aforementioned light-filter layer signal electrode. Two or more video-signal electrodes which intersect them in the shape of a matrix. The common electrode which it has two or more TFT formed corresponding to each intersection of these electrodes, and at least one pixel consists of each field surrounded by the scanning signal electrode and video-signal electrode of the aforementioned plurality, is connected to each pixel over two or more pixels by common electrode wiring, and gives a reference potential. The pixel electrode which was connected to corresponding TFT, countered the aforementioned common electrode and has been arranged in the aforementioned pixel field.

[Claim 2] It has the following. the aforementioned common electrode and the aforementioned pixel electrode It is arranged between the aforementioned light-filter layer and the aforementioned liquid crystal layer, and the aforementioned common electrode and the aforementioned pixel electrode are arranged at a mutually different layer through the demarcation membrane between layers which consists of a transparent insulator. With the voltage impressed between the aforementioned common electrode and the aforementioned pixel electrode, the electric field which had a dominantly parallel component in the aforementioned liquid crystal layer to the 1st substrate of the above occur. And the liquid crystal display which has the 1st substrate, the 2nd transparent substrate and the liquid crystal layer pinched by these characterized by the liquid crystal before voltage is impressed carrying out orientation to the perpendicular mostly to the 1st substrate, and a light-filter layer. The aforementioned light-filter layer is arranged on the substrate of the above 1st, the aforementioned liquid crystal layer is arranged between the aforementioned light-filter layer and the 2nd substrate of the above, and it is two or more scanning-on substrate of the above 1st under aforementioned light-filter layer signal electrode. Two or more video-signal electrodes which intersect them in the shape of a matrix. The common electrode which it has two or more TFT formed corresponding to each intersection of these electrodes, and at least one pixel consists of each field surrounded by the scanning signal electrode and video-signal electrode of the aforementioned plurality, is connected to each pixel over two or more pixels by common electrode wiring, and gives a reference potential. The pixel electrode which was connected to corresponding TFT, countered the aforementioned common electrode and has been arranged in the aforementioned pixel field.

[Claim 3] It is the liquid crystal display with which at least one side is characterized by the bird clapper in a liquid crystal display according to claim 1 or 2 among [ film / transparency electric conduction ] the aforementioned common electrode and the aforementioned pixel electrode.

[Claim 4] The liquid crystal display characterized by having formed the common electrode on the aforementioned light-filter layer, having formed the aforementioned demarcation membrane between layers on this common electrode in the liquid crystal display according to claim 1 or 2, and forming a pixel electrode on the aforementioned demarcation membrane between layers.

[Claim 5] The liquid crystal display characterized by having formed the overcoat layer which protects the aforementioned light-filter layer on the aforementioned light-filter layer in the liquid crystal display according to claim 1 or 2, having formed the common electrode on this overcoat layer, having formed the aforementioned demarcation membrane between layers on this common electrode, and forming a pixel electrode on the aforementioned demarcation membrane between layers.

[Claim 6] The liquid crystal display characterized by having formed the overcoat layer which protects the aforementioned light-filter layer on the aforementioned light-filter layer in the liquid crystal display according to claim 1 or 2, having formed the pixel electrode on this overcoat layer, having formed the aforementioned demarcation membrane between layers on this pixel electrode, and forming a common electrode on the aforementioned demarcation membrane between layers.

[Claim 7] It is the liquid crystal display characterized by the aforementioned common electrode having been formed in the shape of a grid in the liquid crystal display a claim 1 - given in 6 any 1 terms so that the aforementioned pixel might be enclosed, having

arranged the aforementioned pixel electrode so that the inside of the aforementioned pixel may be crossed, and for the aforementioned common electrode having made a part of aforementioned common electrode wiring available, and forming it.

[Claim 8] The liquid crystal display with which the aforementioned common electrode and a pixel electrode are characterized by having arranged two or more sets in the aforementioned pixel in a liquid crystal display a claim 1 - given in 7 any 1 terms.

[Claim 9] It is the liquid crystal display characterized by having seen the aforementioned common electrode from the substrate side of the above 2nd in the liquid crystal display according to claim 7, and being formed so that the aforementioned TFT may hide.

[Claim 10] It is the liquid crystal display characterized by having seen the aforementioned common electrode from the substrate side of the above 2nd in the liquid crystal display according to claim 7, and being formed so that the aforementioned scanning signal electrode and a video-signal electrode may hide.

[Claim 11] The liquid crystal display characterized by making isotropic the refractive-index anisotropy of a liquid crystal layer and a compensation film in a liquid crystal display according to claim 2 by installing a positive compensation film between the 1st or 2nd substrate and a polarizing plate optically with a negative compensation film.

[Claim 12] The liquid crystal display characterized by forming the pre tilt angle beforehand along with the 2-way from which liquid crystal breaks down in a liquid crystal display according to claim 11 when voltage is impressed.

[Claim 13] The liquid crystal display characterized by forming the pre tilt angle in the direction of either in which liquid crystal falls in a liquid crystal display according to claim 11 when voltage is impressed beforehand.

[Claim 14] The liquid crystal display characterized by liquid crystal containing a macromolecule organic compound in a liquid crystal display according to claim 2.

[Claim 15] In the manufacture method of a liquid crystal display of having the 1st substrate, the 2nd transparent substrate, the liquid crystal layer pinched by these, and a light-filter layer The aforementioned light-filter layer is formed on the substrate of the above 1st, and the aforementioned liquid crystal layer is formed between the aforementioned light-filter layer and the 2nd substrate of the above. The scanning signal electrode of plurality [ top / substrate / of the above 1st under the aforementioned light-filter layer ], It forms with two or more TFT formed in them corresponding to each intersection of two or more video-signal electrodes which cross in the shape of a matrix, and these electrodes. The common electrode which constitutes at least one pixel from each field surrounded by the scanning signal electrode and video-signal electrode of the aforementioned plurality, is connected to each pixel over two or more pixels by common electrode wiring, and gives a reference potential, Connect with corresponding TFT and the pixel electrode which carries out opposite arrangement is formed in the aforementioned common electrode in the aforementioned pixel field. The aforementioned common electrode and the aforementioned pixel electrode are arranged between the aforementioned light-filter layer and the aforementioned liquid crystal layer. The aforementioned common electrode and the aforementioned pixel electrode are arranged in a mutually different layer through the demarcation membrane between layers which consists of a transparent insulator. and the aforementioned liquid crystal When the voltage impressed between the aforementioned common electrode and the aforementioned pixel electrode is not impressed Form in the state where orientation is mostly carried out to the perpendicular to the 1st substrate, and the organic material which becomes the aforementioned liquid crystal from a monomer or oligomer is added. The manufacture method of the liquid crystal display characterized by macromolecule-izing the aforementioned organic material in liquid crystal after pouring in the liquid crystal between the 1st substrate of the above, and the 2nd substrate of the above.

[Claim 16] In the manufacture method of a liquid crystal display of having the 1st substrate, the 2nd transparent substrate, the liquid crystal layer pinched by these, and a light-filter layer The aforementioned light-filter layer is formed on the substrate of the above 1st, and the aforementioned liquid crystal layer is formed between the aforementioned light-filter layer and the 2nd substrate of the above. The scanning signal electrode of plurality [ top / substrate / of the above 1st under the aforementioned light-filter layer ], It forms with two or more TFT formed in them corresponding to each intersection of two or more video-signal electrodes which cross in the shape of a matrix, and these electrodes. The common electrode which constitutes at least one pixel from each field surrounded by the scanning signal electrode and video-signal electrode of the aforementioned plurality, is connected to each pixel over two or more pixels by common electrode wiring, and gives a reference potential, Connect with corresponding TFT and the pixel electrode which carries out opposite arrangement is formed in the aforementioned common electrode in the aforementioned pixel field. The aforementioned common electrode and the aforementioned pixel electrode are arranged between the aforementioned light-filter layer and the aforementioned liquid crystal layer. The aforementioned common electrode and the aforementioned pixel electrode are arranged in a mutually different layer through the demarcation membrane between layers which consists of a transparent insulator. and the aforementioned liquid crystal When the voltage impressed between the aforementioned common electrode and the aforementioned pixel electrode is not impressed Form in the state where orientation is mostly carried out to the perpendicular to the 1st substrate, and a positive compensation film is optically formed between the 1st or 2nd substrate and a polarizing plate with a negative compensation film. The manufacture method of the liquid crystal display characterized by forming a pre tilt angle by the rubbing method along with the 2-way from which liquid crystal breaks down when voltage is impressed to the aforementioned compensation film.

[Claim 17] In the manufacture method of a liquid crystal display of having the 1st substrate, the 2nd transparent substrate, the liquid crystal layer pinched by these, and a light-filter layer The aforementioned light-filter layer is formed on the substrate of the above 1st, and the aforementioned liquid crystal layer is formed between the aforementioned light-filter layer and the 2nd substrate of the above. The scanning signal electrode of plurality [ top / substrate / of the above 1st under the aforementioned light-filter layer ], It forms with two or more TFT formed in them corresponding to each intersection of two or more video-signal electrodes which cross in the shape of a matrix, and these electrodes. The common electrode which constitutes at least one pixel



from each field surrounded by the scanning signal electrode and video-signal electrode of the aforementioned plurality, is connected to each pixel over two or more pixels by common electrode wiring, and gives a reference potential, Connect with corresponding TFT and the pixel electrode which carries out opposite arrangement is formed in the aforementioned common electrode in the aforementioned pixel field. The aforementioned common electrode and the aforementioned pixel electrode are arranged between the aforementioned light-filter layer and the aforementioned liquid crystal layer. The aforementioned common electrode and the aforementioned pixel electrode are arranged in a mutually different layer through the demarcation membrane between layers which consists of a transparent insulator. and the aforementioned liquid crystal When the voltage impressed between the aforementioned common electrode and the aforementioned pixel electrode is not impressed Form in the state where orientation is mostly carried out to the perpendicular to the 1st substrate, and a positive compensation film is optically formed between the 1st or 2nd substrate and a polarizing plate with a negative compensation film. The manufacture method of the liquid crystal display characterized by forming a pre tilt angle in the direction of either in which liquid crystal falls when voltage is impressed to the aforementioned compensation film by the rubbing method.

[Claim 18] In the manufacture method of a liquid crystal display of having the 1st substrate, the 2nd transparent substrate, the liquid crystal layer pinched by these, and a light-filter layer The aforementioned light-filter layer is formed on the substrate of the above 1st, and the aforementioned liquid crystal layer is formed between the aforementioned light-filter layer and the 2nd substrate of the above. The scanning signal electrode of plurality [ top / substrate / of the above 1st under the aforementioned light-filter layer ], It forms with two or more TFT formed in them corresponding to each intersection of two or more video-signal electrodes which cross in the shape of a matrix, and these electrodes. The common electrode which constitutes at least one pixel from each field surrounded by the scanning signal electrode and video-signal electrode of the aforementioned plurality, is connected to each pixel over two or more pixels by common electrode wiring, and gives a reference potential, Connect with corresponding TFT and the pixel electrode which carries out opposite arrangement is formed in the aforementioned common electrode in the aforementioned pixel field. The aforementioned common electrode and the aforementioned pixel electrode are arranged between the aforementioned light-filter layer and the aforementioned liquid crystal layer. The aforementioned common electrode and the aforementioned pixel electrode are arranged in a mutually different layer through the demarcation membrane between layers which consists of a transparent insulator. and the aforementioned liquid crystal When the voltage impressed between the aforementioned common electrode and the aforementioned pixel electrode is not impressed Form in the state where orientation is mostly carried out to the perpendicular to the 1st substrate, and a positive compensation film is optically formed between the 1st or 2nd substrate and a polarizing plate with a negative compensation film. The manufacture method of the liquid crystal display characterized by forming a pre tilt angle by optical irradiation along with the 2-way from which liquid crystal breaks down when voltage is impressed to the aforementioned compensation film.

[Claim 19] In the manufacture method of a liquid crystal display of having the 1st substrate, the 2nd transparent substrate, the liquid crystal layer pinched by these, and a light-filter layer The aforementioned light-filter layer is formed on the substrate of the above 1st, and the aforementioned liquid crystal layer is formed between the aforementioned light-filter layer and the 2nd substrate of the above. The scanning signal electrode of plurality [ top / substrate / of the above 1st under the aforementioned light-filter layer ], It forms with two or more TFT formed in them corresponding to each intersection of two or more video-signal electrodes which cross in the shape of a matrix, and these electrodes. The common electrode which constitutes at least one pixel from each field surrounded by the scanning signal electrode and video-signal electrode of the aforementioned plurality, is connected to each pixel over two or more pixels by common electrode wiring, and gives a reference potential, Connect with corresponding TFT and the pixel electrode which carries out opposite arrangement is formed in the aforementioned common electrode in the aforementioned pixel field. The aforementioned common electrode and the aforementioned pixel electrode are arranged between the aforementioned light-filter layer and the aforementioned liquid crystal layer. The aforementioned common electrode and the aforementioned pixel electrode are arranged in a mutually different layer through the demarcation membrane between layers which consists of a transparent insulator. and the aforementioned liquid crystal When the voltage impressed between the aforementioned common electrode and the aforementioned pixel electrode is not impressed Form in the state where orientation is mostly carried out to the perpendicular to the 1st substrate, and a positive compensation film is optically formed between the 1st or 2nd substrate and a polarizing plate with a negative compensation film. The manufacture method of the liquid crystal display characterized by forming a pre tilt angle in the direction of either in which liquid crystal falls when voltage is impressed to the aforementioned compensation film by optical irradiation.

[Claim 20] It is the manufacture method of the liquid crystal display characterized by performing optical irradiation in formation of the aforementioned pre tilt angle from across to the aforementioned compensation film plane in the manufacture method of a liquid crystal display according to claim 18 or 19.

[Claim 21] It is the manufacture method of the liquid crystal display characterized by the optical irradiation in formation of the aforementioned pre tilt angle irradiating polarization from across to the aforementioned compensation film plane in the manufacture method of a liquid crystal display according to claim 20.

[Claim 22] The manufacture method of the liquid crystal display characterized by to include the process which forms TFT on a transparent substrate, the process which forms the passivation film which protects the TFT, the process which applies and exposes them, develops them, calcinates two or more photosensitive color resists one by one, and form a light filter, the process which form a common electrode, the process which form the demarcation membrane between layers which consists of an insulator layer of transparency, and the process which form a pixel electrode.

[Claim 23] The manufacture method of a liquid crystal display characterized by providing the following. The process which forms TFT on a transparent substrate. The process which forms the passivation film which protects the TFT. The process which applies



and exposes them, develops them, calcinates two or more photosensitive color resists one by one, and forms a light filter. The process which forms the overcoat film which protects the light filter, the process which forms a common electrode, the process which forms the demarcation membrane between layers which consists of an insulator layer of transparency, and the process which forms a pixel electrode.

---

[Translation done.]